Application No. 09/427,386

Claims 55-61, 62, 70, 75, 76, and 78-80 were rejected under 35 U.S.C §101 as claiming the same invention as Claims 1-7, 14 and 19-23 of prior U. S. Patent Number 6,304,376. In response, Applicants have cancelled Claims 55-60, 75 and 76, in order to obviate the double patenting rejection under 35 U.S.C. §101.

Reconsideration and further examination are respectfully requested.

With regard to Claims 62, 70, and 78-80, Applicants submit that the inventors of the present application are the priority inventive entity with respect to the subject matter contained within Claims 62, 70, and 78-80. In this regard, Applicants would note that the present application takes priority from the same provisional application serial number 60/105,626 filed October 26, 1998 as the application which issued as U.S. Patent Number 6,304,376. Applicants would respectfully submit there is a commonality of inventive entity at least with respect to Claims 62, 70, and 78-80 between the present application and the application which issued as U.S. Patent Number 6,304,376.

Claims 61, 6-69, 71-74, 77 and 81-88 were rejected for obviousness-double patenting over Claims 1-23 of U.S. Patent Number 6,304,376. In response, Applicants file herewith a terminal disclaimer disclaiming the lifetime of any patent which issues on the present application beyond the lifetime of U.S. Patent Number 6,304,376.

Reconsideration and withdrawal of the obviousness-double patenting rejection is requested. In this regard, Applicants would submit that Claims 62, 70, and 78-80 are claims, which depend respectively, from Independent Claims 61, 69, and 77. Since these claims depend from independent claims that are deemed patentable, although subject to terminal disclaimer requirements, Applicants would respectfully submit that Dependent Claims 62, 70, and 78-80 are also patentable. Reconsideration and further examination are respectfully solicited.

Claims 61 and 63 were rejected under U.S.C. §103(a) for obviousness over U.S. Patent Number 4,764,881 to Gagnon in view of U.S. Patent Number 5,912,541 to Bigler, et al. Applicants respectfully traverse this rejection.

In particular, the Examiner has characterized the Gagnon reference as disclosing substantially the invention as claimed except for a motor portion having a motion indicator coupled to the motor. Bigler, et al, is relied upon to provide this deficiency in Gagnon. Independent Claim 61 requires not only a motion indicator coupled to the motor, but also an

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intelligent motor control processor coupled to the motor and a motion indicator. Neither Gagnon nor Bigler, et al, can be understood to disclose or suggest this particular feature of the invention. Specifically, the only processor discussed in the Gagnon reference is a microprocessor 40 which is connected to a clock 51 and communicates with a pair of input/output devices 52 and 54 via the address and data buses. The only circuitry disclosed in Gagnon that relates to motors are the altitude and azimuth motor driver circuits 62 and 64 which are conventional motor drivers used to operate Gagnon's altitude and azimuth stepper motors 28 and 36.

As is well understood by those having skill in the art, stepper motor driver circuits are nothing more than actuators which do nothing more than translate a "pulse train" into a winding actuation sequence by which the motor "steps." There is nothing in the Gagnon reference which discusses a motor-controlled processor which is coupled to receive motor movement commands from a command processor and which processes each respective motor movement command into motor control commands defining operational movement of the motor. Gagnon's motor drivers cannot be understood to perform this function, nor can they be understood as having the capability of comparing actual operational movement to commanded operational movement, and as particularly not understood as being able to modify motor control commands in response to differences therebetween.

Bigler, et al, is not understood as disclosing or suggesting anything that would remedy the deficiencies of Gagnon as a reference. In particular, Bigler, et al, discloses a simple servo-controller, which has been structurally mated to a motor body in order to provide a unitary apparatus, which eliminates the wiring harnesses of the prior art and related signal noise in the wiring problems. Bigler, et al, does not disclose or suggest an automated telescope system, which comprises a command processor able to perform the claimed calculations and two intelligent motor portions, each including an intelligent motor control processor.

The combination of Gagnon and Bigler, et al, is counter-intuitive given the disclosures of the '541 and '881 patents. In particular, Gagnon describes a specific telescope system operated by stepper motors and having a quite specific collection of internal components. A person having ordinary skill in the art, would have to reject Gagnon's entire system and replace it wholesale in order to utilize a Bigler apparatus. Further, one having ordinary skill would have to replace the entire Gagnon apparatus wholesale in order to utilize the Bigler, et al, system. Every

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substantially functional portion of the Gagnon apparatus (i.e., MPU40, input/output device 54, and altitude and azimuth motor drivers 62 and 64) would have to be removed and replaced by a substantially different device. Indeed, in order to combine Bigler, et al, with Gagnon, one would be required to develop a system in accordance with the elements of Independent Claim 61. Where there is no guidance in either the Bigler, et al, or the Gagnon reference as to how a system might be implemented, reliance on the disclosure of the present application and the elements of Independent Claim 61, constitute impermissible hindsight supporting an obviousness combination of Bigler, et al, and Gagnon.

In view of the foregoing, reconsideration and further examination of Independent Claim 61 is respectfully requested.

With regard to Claim 63, it depends from Independent Claim 61 and partakes of its novelty. Accordingly, reconsideration and withdrawal of the rejection of Claim 63 is also requested.

Claim 64 was rejected under 35 U.S.C. §103(a) for obviousness over Gagnon in view of Bigler, et al, and further in view of U.S. Patent Number 4,074,128 to Harris, et al. Applicants respectfully traverse this rejection.

Claim 64 depends ultimately from Claim 61 and partakes of its novelty. For the reasons given above with respect to Independent Claim 61, Applicants would respectfully submit that Dependent Claim 64 is patentable and respectfully request reconsideration and withdrawal of the rejection of Claim 64 under U.S.C. 35 §103(a).

Notwithstanding the foregoing, it would not be obvious to one having ordinary skill in the art to combine the subject matter of the Harris, et al, reference with either Bigler, et al, Gagnon, or both. Specifically, and as mentioned above, combining Bigler, et al, with Gagnon would require a complete redesign of the Gagnon apparatus, making the Gagnon disclosure irrelevant. Further, Bigler, et al, discusses a particular implementation of a unitary motor and servo-controller, which includes a proportional integral derivative filter (PID) which operates on information received by Hall sensors that determine a general position of a magnet coupled to the motor's rotor. The Bigler, et al, encoder is discussed only as being able to determine 2,000 incremental positions of the rotor.

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Application No. 09/427,386

Once again, in order to operate the Bigler, et al, apparatus in conformance with the Harris, et al, system, the Bigler, et al, apparatus would have to be completed reconstructed in order to accommodate a Harris-type two-phase shaft encoder. For this reason, Applicants respectfully submit that Harris, et al, does not remedy any of the deficiencies of either Bigler, et al, or Gagnon, or any permissible combination of the two as references against Claim 64 of the present application.

In view of the foregoing, and the appended terminal disclaimer, Applicants respectfully submit that Claims 61-74 and Claims 77-78 are patentable and the application is condition for allowance. Early notification of same and passage to issue are respectfully requested.

Please address all correspondence to **STRADLING YOCCA CARLSON & RAUTH, IP Department, 660 Newport Center Drive, Suite 1600, P.O. Box 7680, Newport Beach, California 92660-6441.**

Respectfully submitted,

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Application No. 09/427,386

IN THE CLAIMS

Please cancel Claims 55-60, 75 and 76.

1 ~~61~~. An automated telescope system of the type including a telescope mounted for rotation about an altitude and an azimuth axis, the automated telescope system comprising:

a command processor, the command processor receiving an input representing a position of a desired viewing object, the position characterized in terms of a celestial coordinate system, the command processor translating the input into a position characterized in terms of an altitude/azimuth coordinate system, the command processor calculating an amount of movement about each axis, to move the telescope from a present position to a desired position which points the telescope at the desired viewing object, the command processor outputting motor movement commands for each respective axis; and

two intelligent motor portions, each coupled to rotate the telescope about a respective one of the axes, each motor portion including :

B1

a motor having a rotatable shaft;

a motion indicator coupled to the motor, the motion indicator developing motion indication signals corresponding to actual motor movement; and

an intelligent motor control processor, coupled to the motor and the motion indicator, the motor control processor further coupled to receive motor movement commands from the command processor, the motor control processor processing each respective motor movement command into motor control commands defining operational movement of the motor, the motor control processor further receiving motion indication signals and comparing actual operational movement of its respective motor to commanded operational movement, the motor control processor modifying motor control commands in response to differences therebetween.

2 ~~62~~. The telescope system according to claim 1 ~~61~~, the motor control processor including a position register, the register storing a calculated actual extent of motor movement wherein the motor control processor provides the register contents to the command processor, the command processor translating the register contents into telescope angular displacement about the corresponding axis and thereby into a present telescope position.

31

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3 ~~63~~. (Amended) The telescope system according to claim ~~62~~ 2 wherein the motion indicator comprises an incremental encoder, the motion indication signals corresponding to increments of the encoder, a timing between increments corresponding to a speed of movement and an amount of increments corresponding an actual extent of movement.

4 ~~64~~. The telescope system according to claim ~~63~~ 3 wherein the incremental encoder comprises an optical encoder operating in quadrature, the motor control processor processing the quadrature signal to determine motor speed and motor rotation direction.

5 ~~65~~. The telescope system according to claim ~~64~~ 4 wherein the motor control processor increments the position register with an actual extent of movement when the motor rotates in a first direction and wherein the motor control processor decrements the position register with an actual extent of movement when the motor rotates in a second direction.

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6 ~~66~~. The telescope system according to claim ~~61~~ 1 further comprising:

a geographic location database coupled to the command processor, the database containing entries each associating a geographic place name with a corresponding set of earth-based coordinates; and

wherein the command processor receives a place name input corresponding to a geographic location proximate to a user, the command processor processing the corresponding set of earth-based coordinates and the contents of both motor controller's position registers so as to determine the present position of the telescope system with respect to the celestial coordinate system.

7 ~~67~~. The telescope system according to claim ~~66~~ 6 further comprising:

a celestial object database coupled to the command processor, the database containing entries each associating a celestial object with a corresponding set of celestial coordinates; and

wherein the command processor receives an input corresponding to a desired celestial object to view, the command processor processing the corresponding set of celestial coordinates and the present position of the telescope system so as to calculate an amount of altitude and azimuth axis movement sufficient to point the telescope to the desired celestial object, the command processor further calculating a dynamic movement profile for each axis so as to track the desired celestial object's motion.

8 ~~68~~. The telescope system according to claim 7 ~~67~~ wherein the command processor translates each axis' dynamic movement profile into motor speed and direction commands and outputs said motor commands to the corresponding motor control processor, the motor control processor controlling motor movement in response thereto, thereby freeing the command processor to perform further processing and calculation tasks during telescope movement

9 ~~69~~. In an automated telescope system of the type including a telescope mounted for rotation about two substantially orthogonal axes, a method for operating the system comprising:

retrieving an input representing a position of a desired viewing object, the position characterized in terms of a celestial coordinate system;

processing the input in a command processor into a position characterized in terms of a rectangular coordinate system, the command processor determining a present position about each axis, and calculating a displacement in the rectangular coordinate system for each axis to point the telescope at the desired viewing object;

B1 cont

processing each axial displacement into motor movement commands for that axis;

outputting each motor movement command to a corresponding motor control processor coupled to that axis;

processing each respective motor movement command, in each said respective motor control processor, into motor control commands defining operational movement of a motor coupled to each respective axis;

operating each motor in accordance with its motor control commands;

evaluating actual operational movement of each motor by a motion sensor, the sensor developing motion indication signals corresponding to an amount of motor rotational movement, the evaluating step including:

reading an amount of motor rotational movement;

calculating a total amount of motor movement;

recording the total amount as a content of a position register; and

providing the register contents to the command processor, wherein the command processor translates the register contents into telescope angular displacement about the corresponding axis and thereby a present telescope position.

10 ~~70~~. The method according to claim ~~69~~ 9, wherein each respective motor control processor compares actual operational movement of its respective motor to commanded operational movement and modifies motor control commands in response to differences therebetween.

11 ~~71~~. The method according to claim ~~69~~ 9, wherein the motion sensor comprises an incremental encoder, the motion indication signals corresponding to increments of the encoder, a timing between increments corresponding to a speed of movement and an amount of increments corresponding an extent of movement . 9/26/02

12 ~~72~~. The method according to claim ~~71~~ 11, wherein the incremental encoder comprises an optical encoder operating in quadrature, the motor control processor processing the quadrature signal to determine motor speed and motor rotation direction.

13 ~~73~~. The method according to claim ~~72~~ 12, further comprising:

incrementing the contents of the position register with an extent of movement when the motor rotates in a first direction; and

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decrementing the contents of the position register with an extent of movement when the motor rotates in a second direction.

14 ~~74~~. The method according to claim ~~69~~ 9, further comprising:

accessing a celestial object database coupled to the command processor, the database containing entries each associating a celestial object with a corresponding set of celestial coordinates; and

providing an input corresponding to a desired celestial object to view;

providing the corresponding set of celestial coordinates from the database;

retrieving the corresponding set of celestial coordinates and the present position of the telescope system so as to calculate an amount of altitude and azimuth axis movement sufficient to point the telescope to the desired celestial object;

calculating a dynamic movement profile for each axis so as to track the desired celestial object's motion.

translating each axis' dynamic movement profile into motor speed and direction commands; and

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outputting said motor commands to the corresponding motor control processor, wherein the motor control processor controls motor movement in response thereto, thereby freeing the command processor to perform further processing and calculation tasks during telescope movement.

B2

16 ~~78~~. The telescope system according to claim ~~77~~ 15, wherein each motor control processor translates received motor movement commands into motor control commands, each motor control processor commanding motor movement and receiving encoder signals corresponding to actual motor movement, each motor control processor providing its register contents to the command processor, the command processor translating the register contents into telescope angular displacement about the corresponding axis to calculate thereby a present telescope position, the motor control processor processing received encoder signals to calculate an actual extent of motor movement.

17 ~~79~~. The telescope system according to claim ~~78~~ 16, wherein the input corresponding to a position of a desired viewing object is characterized in terms of a celestial coordinate system.

18 ~~80~~. The telescope system according to claim ~~79~~ 17, wherein the input corresponding to a present position of the telescope is characterized in terms of a rectangular coordinate system.

19 ~~81~~. The telescope system according to claim ~~77~~ 15 wherein the signals output by the encoder correspond to increments of the encoder, a timing between increments corresponding to a speed of movement and an amount of increments corresponding to an extent of movement.

20 ~~82~~. The telescope system according to claim ~~81~~ 19, wherein the incremental encoder comprises an optical encoder operating in quadrature, the motor control processor processing the quadrature signal to determine motor speed and motor rotation direction.

21 ~~83~~. The telescope system according to claim ~~82~~ 20, wherein the motor control processor increments the position register with a received extent of movement when the motor rotates in a first direction and wherein the motor control processor decrements the position register with a received extent of movement when the motor rotates in a second direction.

22 ~~84~~. The telescope system according to claim 21 ~~83~~, wherein the automated telescope system is of the type including a telescope mounted for rotation about an altitude and an azimuth axis.

23 ~~85~~. The telescope system according to claim 15 ~~77~~, further comprising:

a celestial object database coupled to the command processor, the database containing entries each associating a celestial object with a corresponding set of celestial coordinates; and

wherein the command processor receives an input corresponding to a desired celestial object to view, the command processor processing the corresponding set of celestial coordinates and the present position of the telescope system so as to calculate an amount of altitude and azimuth axis movement sufficient to point the telescope to the desired celestial object.

24 ~~86~~. The telescope system according to claim 23 ~~85~~, wherein the command processor further calculates a dynamic movement profile for each axis so as to track the desired celestial object's motion.

B2 END

25 ~~87~~. The telescope system according to claim 24 ~~86~~, wherein the command processor translates each axis' dynamic movement profile into motor speed and direction commands and outputs said motor commands to the corresponding motor control processor, the motor control processor controlling motor movement in response thereto, thereby freeing the command processor to perform further processing and calculation tasks during telescope movement.

26 ~~88~~. The telescope system according to claim 25 ~~87~~, further comprising:

a geographic location database accessible to the command processor, the database containing entries each associating a geographic place name with a corresponding set of earth-based coordinates; and

wherein the command processor receives a place name input corresponding to a geographic location proximate to a user, the command processor processing the corresponding set of earth-based coordinates and the contents of both motor controllers' position registers so as to determine the present position of the telescope system with respect to the spherical coordinate system.